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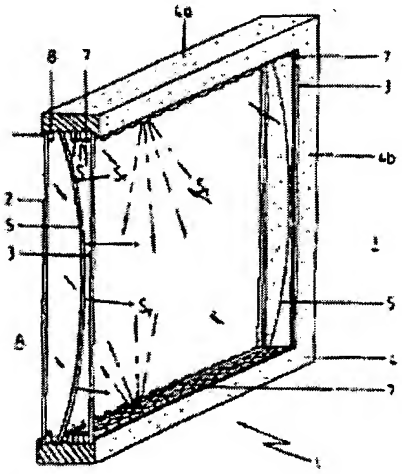
(54) Title: WINDOW ASSEMBLY FOR SCREENING AND LIGHTING INNER ROOMS

(57) Abstract

Window assembly for screening and lighting inner rooms. The object of the invention is on the one hand to sun-screen inner rooms and on the other hand to light inner rooms with an optimum light intensity. The light intensity may be regulated by means of sensors and a manual control, thus improving the physical and psychological well-being of the human being. The coloured lamps (7, 8) form a colour spectrum. The coloured lamps (8) protect against exposure to outer radiation. The coloured lamps (7) light the inner room. The light rays from the coloured lamps (7) hit the curved flat element (5) and are reflected into the inner room. In figure 2 is illustrated another solution that may be useful for very large surface windows. The design is similar to that in figure 1 but contains an additional cavity filled with a liquid (phosphorescent or the like). Electric pulses cause said liquid to shine at regular intervals. This window assembly offers a compact system to consumers, useful for inner rooms of dwelling and commercial buildings, cars, trains, aeroplanes, greenhouses, indoor gardens, and in future sun-screening devices.



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Window Assembly for Screening and Lighting Inner Rooms

The invention relates to a window assembly for screening and lighting the inner rooms of buildings, vehicles and the like through the window opening, where at least one transparent window surface is inserted in a frame that is installed with a seal in the window opening.

To influence [control] the light that enters a room or to provide a visibility screen [possibly "privacy screen"]* for the inner room through the window surface, nontransparent hangings [drapes] or curtains, fixed or adjustable rollers, and finally glass panes prepared in various ways are used. With such glass panes it is possible, for example, to polarize light that is incident from the outside, and thus to partially or completely prevent the entry of the light, or to influence the reflection, the passage of light, or the transparency of the glass surfaces by applied layers as desired.

However, if the goal is only to provide privacy screening for the inner room, such measures are too expensive. On the other hand, sun rollers, blinds and the like interfere with the field of vision to the outside, or vision from the inside is completely prevented, as in the case of curtains.

Finally, the incidence of light, to the extent that is needed for lighting a room, is considerably reduced by hangings, curtains or blinds, unless they are pushed aside. It is precisely in public buildings, commercial buildings, rooms with large window surfaces, or vehicles that the technical expense for such items is high. They are difficult to handle, and therefore are often considered inconveniences.

* [In the abstract, it states that the use of this window assembly is to "sun-screen" the inner rooms]

In addition, it is necessary to lighten inner rooms of buildings, vehicles and the like with artificial light to the extent that, in darkness or in the case of strong screening of the window surface outward, the light entering the room can be expected to be insufficient. For this purpose, appropriate lighting appliances are installed in the inner room, which, in the end, are again associated with considerable installation costs.

The invention is therefore based on the problem of developing a window assembly that on the one hand provides a privacy screen against viewing from the outside inward, and, at the same time, does not darken the inner room, and even lightens it.

According to the invention, the problem is solved with a window assembly for screening and lighting the inner rooms of buildings, vehicles and the like via the window opening, where a transparent window surface inserted in a frame is installed with a seal in the window opening, in such a way that the transparent window surface is a window assembly that is curved towards the inner room and associated, on its convex side, with radiating lamps that are attached to the frame, radiating diagonally over the surface of the curved window assembly.

The basic idea of the invention, in other words, is that a window pane [assembly] that is curved towards the inner room is used to create--by means of artificial light that is incident on the window pane at an acute angle and in the immediate vicinity--a light reflection surface that, on the one hand, has the effect of producing an indirect, large-surface room lighting from the side of the window surface, which, in the case of normal daylight, also corresponds to the natural light source in the room, and, on the other hand, produces the effect of a privacy screen for the inner room as a result of the created reflection surface. Such a window assembly can be produced with a simple means. Its structure is user-friendly with regard to maintenance, repair and handling, and it allows a multitude of application possibilities, for example, in dwelling and office buildings or other public buildings, traffic means that are provided with windows, and winter gardens or greenhouses. The lamps that are used to light the room via the curved window surface can have a variety of designs, for example, they can be fluorescent light tubes or spot lamps. They can be directed from one side, or from two opposite sides, or from all sides of the frame, onto the curved surface element. A single light source, or a multitude of light sources can radiate onto the curved window assembly. The lamps can be switched on manually or automatically —

as a function of the brightness in the room — via sensors. Moreover, the light sources can also be designed to emit colored light.

The curved transparent window assembly preferably consists of glass, and it can be curved towards the inner room in the shape of an arc of a circle or in the shape of a lens. In addition, to increase the reflection effect, its convex sides can be provided, partially or completely, with a reflecting but transparent coating, or it can be treated in another way to achieve, for example, a light scattering effect.

In an advantageous embodiment of the invention, the additional colored lamps are located on the concave side of the curved window assembly to provide an additional, particularly colored, screening of the window surface on the exterior side. The colored lamps, which in principle can also emit white light, are also attached to the facing inner surfaces of the frame.

In another embodiment of the invention, the window assembly is designed as a double window with, in each case, an external or an interior window glass surface connected with a seal in the frame and arranged in the area of the exterior or interior side of the frame, where the above-described lights [lamps] and the curved light-reflecting surface element are accommodated with a seal against dust and humidity in the space formed by the two window glass surfaces.

According to another characteristic of the invention, a hollow body is located in the space formed between the concave side of the curved surface element and the exterior window glass surface. This hollow body is filled with a color tinged medium, for example, gas or liquid, particularly for absorbing sunlight. The medium can be provided with phosphorescent components to achieve an intrinsically luminescent effect, after the appropriate light effect. On the other hand, a change in the color of the liquid located in the hollow body can be produced electrically by incorporating an appropriate fluid in an electrical circuit. For this purpose, electrical connections are located on the front side of the hollow body. The color effect of the medium present in the hollow body, finally, can be made more intense by arranging privacy screen lamps, which emit light into the light absorbing medium from the front sides of the hollow body. These screen lamps also optionally serve to excite [enhance] the light effect in the medium of the intrinsically emitting substances that are present.

Additional characteristics and advantageous variants of the invention are indicated in the dependent claims.

An embodiment example of the invention is explained in greater detail with reference to the drawings. In the drawings:

Figure 1 shows a window assembly for lighting or illuminating the inner room and for providing visibility screening from the outside for said room, which assembly is to be introduced into the window opening of a building; and

Figure 2 shows the window assembly according to Figure 1 with, however, a hollow body that is filled with the liquid medium for the additional absorption of incident light rays.

The window assembly 1 according to the invention consists of a frame 4 with, in each case, horizontal frame parts 4a and vertical frame parts 4b. On the front, outwardly (A) directed side of the frame 4 as well as on the back side of the frame 4, which is directed towards the inner room (I), an external window glass surface 2 or an internal window glass surface 3 is attached with a seal. Between these two window glass surfaces 2 and 3 — with protection against dust and humidity — a transparent surface element 5 is located, which is curved towards the inner room (I). In the space between the inner window glass surface 3 and the curved surface element 5, on mutually facing inner surfaces of the horizontal frame parts 4a, light rails are attached, with lamps 7 that are slid on them. The light ray from the lamps 7 is oriented at an acute angle onto the outwardly curved side of the surface element 5 in the form of a glass pane. The light S of the lamps 7, which is radiated against the convex curved glass surface of the surface element 5, is reflected due to the mirror effect by this surface and radiated in the form of reflected rays Sr into the inner room (I). As a result, on the one hand, an indirect artificial lighting of the inner room from the window — corresponding to the normal entrance of daylight — is achieved; on the other hand, a privacy screen preventing viewing from the outside inward is achieved by the mirror surface so formed. The lamps 7 are switched on additionally, as a function of the light requirement in the room or the brightness outside, either manually or automatically via sensors. It is possible to switch on a few or all of the lamps 7. In addition, the brightness of the lamps is adjustable, finally, the lamps can also be designed so that they radiate colored light into the inner

room, and thus, at the same time, achieve a special color effect for the exterior side of the window.

To reinforce the privacy-screen effect it is also possible, as shown in Figure 1, to arrange additional colored lamps 8 in the space between the exterior window glass surface 2 and the concave curved side of the transparent surface element 5. These colored window lamps can also be switched on independently of the lamps 7 used for lighting the room so that, in this case as well, the privacy screen protecting from outside viewing is ensured. The light of the colored lamps 8 is not radiated into the inner room. Naturally, light of different colors can also be used for the colored lamps 8 — as for the lamps 7.

Figure 2 shows an additional embodiment of the present invention. The window assembly 1 here is constructed as described in Figure 1. However, in addition, a hollow body 6 made of transparent material, which covers the entire surface between the frame parts 4a, 4b, is arranged in the space remaining between the concave side of the transparent, curved surface element 5 and the colored lamps 8. The hollow body 6 is filled with a light absorbing, colored medium 10. In addition, on one or more front sides of the hollow body 6, screen lamps 10 are situated, directing light rays preferably directly onto the medium 10. The hollow body 6 with the medium contained in it serves primarily to provide a sun screen. In addition, it also has a visibility [privacy] screening effect; finally, special color or light effects can also be achieved. For example, the medium 10 can be a phosphorescent, intrinsically luminescent liquid whose lighting effect in darkness can always be re-excited at intervals by the screen lamps 9. On the other hand, the medium 10 can be an electrolytic solution that is connected to a current source (not represented) to achieve--by ionic conversion and under the influence of the electrical current--a color change or a change in the color intensity as a function of the intensity of the sunlight to be absorbed.

Other variants of the described embodiment examples are also conceivable without problems. For example, it is possible, in the case of the embodiment explained in reference to the figures, to omit the colored lamps; another embodiment variant might be to omit the colored lamps as well as the hollow body with the screening [privacy] lamps.

Parts list:

1	Window assembly
2	Exterior window glass surface
3	Interior window glass surface
4	Frame
4a	Horizontal frame parts
4b	Vertical frame parts
5	Curved, transparent surface elements
6	Transparent hollow body
7	Lamps for light reflection/room lighting
8	Colored lamp
9	Screen lamp
10	Medium
A	Exterior side
I	Inner room

Claims

1. Window assembly for screening and lighting the inner rooms of buildings, vehicles and the like through the window opening, where at least one transparent window surface inserted in a frame is installed with a seal in the window opening, **characterized in that** the transparent window surface is a surface element (5) that is curved towards the inner room (I), and associated with lamps (7), which are attached on its convex side to the frame (4) and which radiate light beams at an angle onto the surface of the curved surface element (5).

2. Window assembly according to Claim 1, **characterized in that** the surface element (5) is curved in the shape of an arc of a circle.

3. Window assembly according to Claim 1, **characterized in that** the surface element (5) is curved in the shape of a lens.

4. Window assembly according to one of Claims 1-3, **characterized in that** the curved surface element (5) is made of glass.

5. Window assembly according to one of Claims 1-4, **characterized in that** the convex side of the curved surface element (5) is coated partially or completely with a light reflecting material, or is treated appropriately.

6. Window assembly according to one of Claims 1-4, **characterized in that** the convex side of the surface element (5) is treated to achieve a light scattering effect, for example, by etching.

7. Window assembly according to one of Claims 1-6, **characterized in that** lamps (7) are arranged emitting white light or, in each case, light of different colors.

8. Window assembly according to one of Claims 1-8 [sic], **characterized in that**, as the light source, fluorescent light tubes, or spot lamps arranged on a light rail, are provided.

9. Window assembly according to one of Claims 1-8, **characterized in that**, on the convex side of the curved surface element (5), and separately from the latter, colored lamps (8) are attached on the frame (4).

10. Window assembly according to Claim 9, **characterized in that** the colored lamps (8) are designed so that they confer different or the same type of colored light.

11. Window assembly according to one of Claims 1-10, **characterized in that** the lamps (7) and the colored lamps (8), which are provided for room illumination, can be switched on and off automatically via sensors as a function of the outside brightness, and with respect to the light intensity.

12. Window assembly according to one of Claims 1-11, **characterized in that** the colored lamps (8), the curved surface element (5), and the lamps (7), which are directed at an angle onto the convex side of the surface element (5), are arranged with a seal against dust and humidity between two window glass surfaces (2, 3), which are attached on the frame (4).

13. Window assembly according to one of Claims 1-12, **characterized in that**, in the space between the colored lamps (8) and the curved surface element (5), a transparent hollow body (6) is arranged, which is filled with a medium (10) that presents a certain hue.

14. Window assembly according to Claim 13, **characterized in that** the hollow body (6) is made of glass.

15. Window assembly according to Claims 13 and 14, **characterized in that**, on the front sides of the hollow body (6), the screen lamps (9) that illuminate the medium (10) are attached.

16. Window assembly according to one of Claims 12-15, **characterized in that** the medium (10), which is present in the hollow body (6), is a liquid whose hue can be adjusted to different colors.

17. Window assembly according to one of Claims 12-15, **characterized in that** the medium (10) is fluorescent or phosphorescent, on the basis of [based on the use of] intrinsically luminescent or phosphorescent luminous substances.

18. Window assembly according to one of Claims 12-15, **characterized in that** the medium is an electrolyte, which is connected to a source of current.

Fig. 1

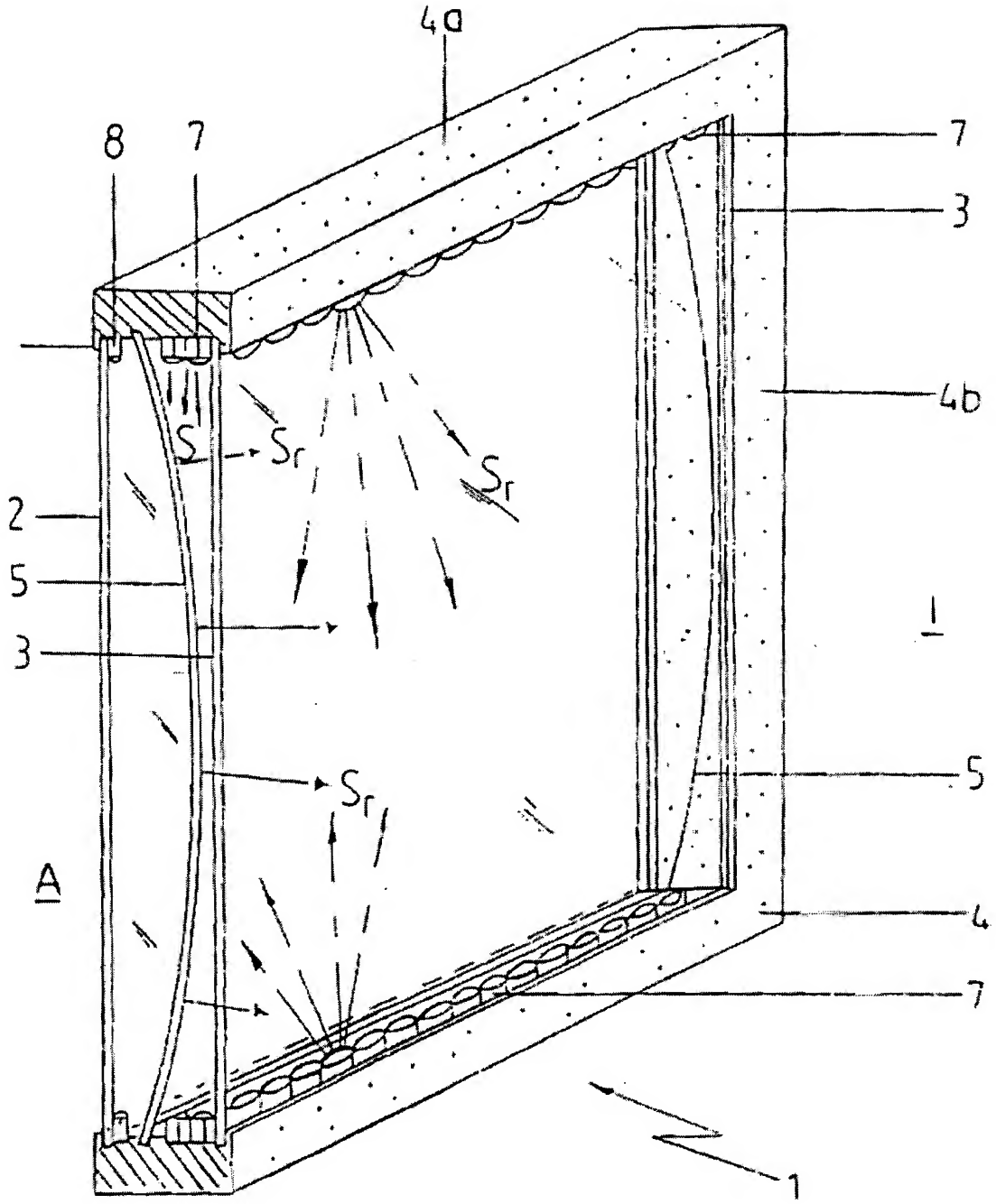
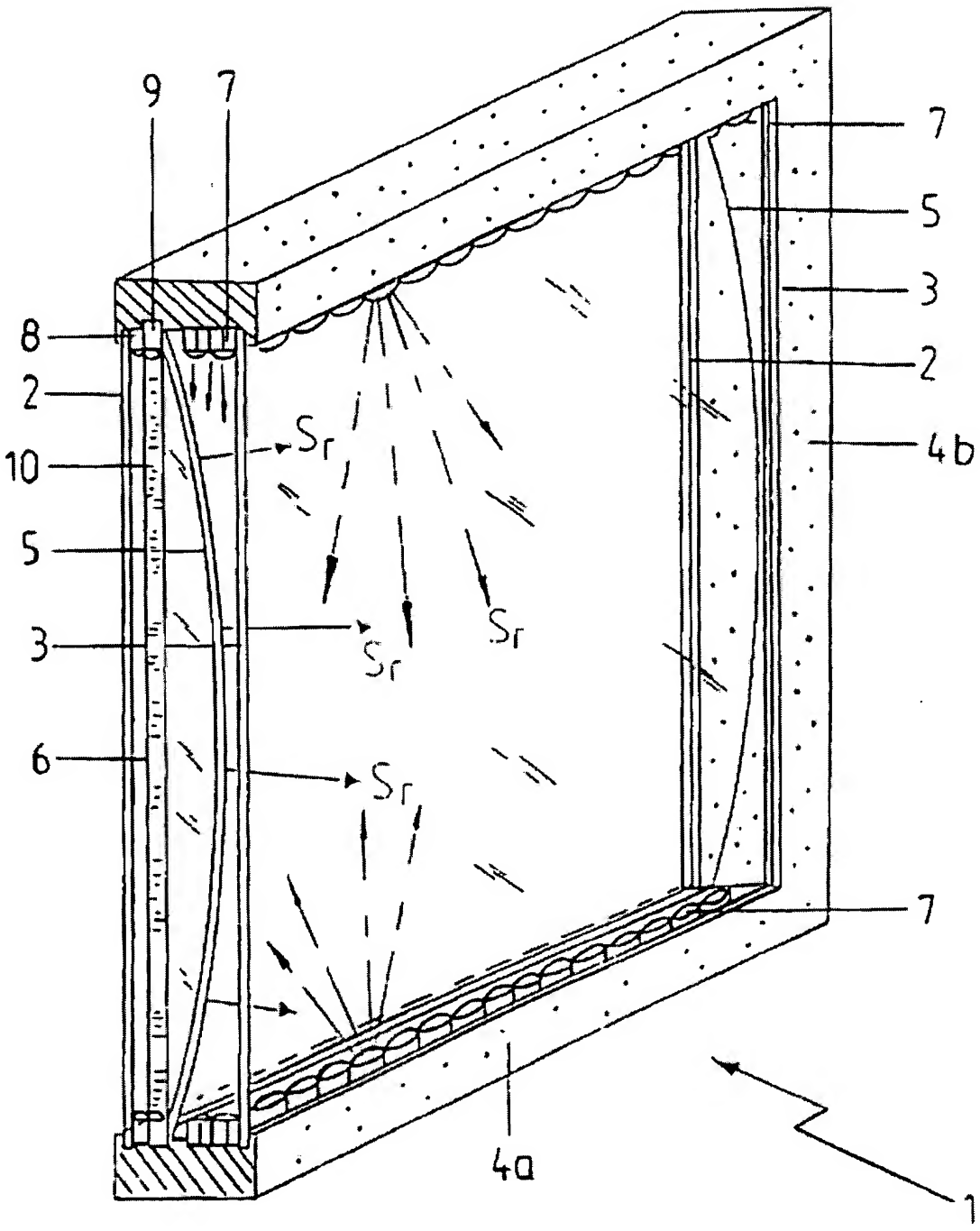


Fig. 2



INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/DE 96/00453

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E06B7/00 E06B9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,28 30 718 (GLAS- UND SPIEGEL-MANUFACTUR AG) 21 February 1980 see the whole document ---	1,3,4
A	GB,A,1 322 703 (FINN BENTJIN ET AL.) 11 July 1973 see the whole document ---	1,5
A	DE,A,21 20 375 (ANSTALT F. BERATUNG, PATENT- UND URHEBERRECHTSVERWALTUNG) 2 November 1972 see the whole document -----	1,4

☐ Further documents are listed in the continuation of box C.

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-2830718	21-02-80	NONE		
GB-A-1322703	11-07-73	AT-B-	323392	10-07-75
		BE-A-	752960	16-12-70
		CH-A-	519641	29-02-72
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		FR-A-	2054255	16-04-71
		LU-A-	61278	10-09-70
		NL-A-	7010149	12-01-71
		SE-B-	355209	09-04-73
DE-A-2120375	02-11-72	NONE		

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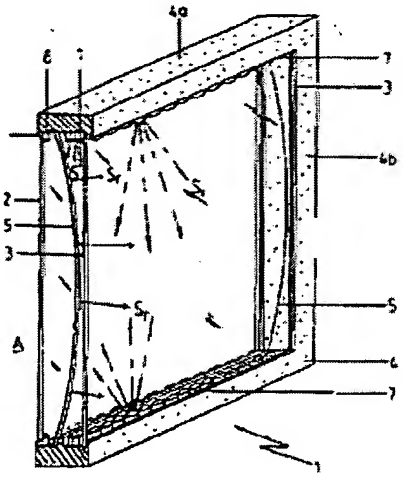
November 21, 1996

(54) Title: WINDOW ASSEMBLY FOR SCREENING AND LIGHTING INNER ROOMS

(57) Abstract

Window assembly for screening and lighting inner rooms. The object of the invention is on the one hand to sun-screen inner rooms and on the other hand to light inner rooms with an optimum light intensity. The light intensity may be regulated by means of sensors and a manual control, thus improving the physical and psychological well-being of the human being. The coloured lamps (7, 8) form a colour spectrum. The coloured lamps (8) protect against exposure to outer radiation. The coloured lamps (7) light the inner room. The light rays from the coloured lamps (7) hit the curved flat element (5) and are reflected into the inner room. In figure 2 is illustrated another solution that may be useful for very large surface windows. The design is similar to that in figure 1 but contains an additional cavity filled with a liquid (phosphorescent or the like). Electric pulses cause said liquid to shine at regular intervals. This window assembly offers a compact system to consumers, useful for inner rooms of dwelling and commercial buildings, cars, trains, aeroplanes, greenhouses, indoor gardens, and in future sun-screening devices.



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AMENDED CLAIMS

[Received at the International Office on October 11, 1996; original Claims 13 and 15-18 amended; other claims unchanged (1 page)]

13. Window assembly according to Figure 2,
characterized in that, in the space between the two interior and exterior window glass surfaces 2 and 3, a transparent hollow body (6) is arranged, which is filled with a medium (10) that presents a certain hue.

14. Window assembly according to Claim 13, **characterized in that** the hollow body (6) is made of glass.

15. Window assembly according to Claims 13 and 14, **characterized in that** screen lamps (9), which illuminate the medium (10), can be attached to the front sides of the hollow body (6).

16. Window assembly according to one of Claims 13-15, **characterized in that** the medium (10), which is present in the hollow body (6), can be a liquid whose hue can be adjusted to different colors.

17. Window assembly according to one of Claims 13-16, **characterized in that** the medium (10) is fluorescent or phosphorescent, on the basis of intrinsically luminescent or phosphorescent luminous substances.

18. Window assembly according to one of Claims 13-17, **characterized in that** the medium is an electrolyte, which is connected to a current source.

AMENDED PAGE (ARTICLE 19)

DECLARATION MENTIONED IN ARTICLE 19

The cross references to Claims 16, 17, 18, 12, 13 were changed.

- Claim 16: The cross reference Claim "13-15" was made because the medium (10) present in the hollow body (6)--that is, the liquid whose hue can be adjusted to different colors--is based on Claims 13, 14, and 15, i.e., Claim 16 is a part of Claims 13, 14, 15, or the above-mentioned claims are connected (according to the text of the description).
- Claim 17: The cross reference Claim "13-16" was made because the medium (10) is phosphorescent or fluorescent on the basis of intrinsically luminescent or phosphorescent luminous substances, on which Claims 13, 14, 15, and 16 are based, or, i.e., Claim 17 is a part of Claims 13, 14, 15, and 16, or the above-mentioned claims are connected (according to the text of the description).

- Claim 18: The cross reference Claim "13-17" was made because the medium (10) is an electrolyte that is connected to a current source, on which Claims 13, 14, 15, 16, and 17 are based, i.e., Claim 18 is a part of Claims 13, 14, 15, 16, 17, or, the above-mentioned claims are connected (according to the text of the description).

  In summary, it can be noted that Claims 16, 17, and 18 were amended because without the corrected cross reference, the function of the screening or lighting in reference to Figure 2 of the described system cannot be illustrated (see the text of the description).

- Claim 12: The cross reference of Claims 13, 14, 15, 16, 17, and 18 in reference to Claim 12 was amended because Figure 2 should represent an additional variant for screening and lighting; it is not necessary to fulfill this function again by [referring to] parts of Figure 1.
  Reason: The screen lamps (9) take over the function of lighting the medium (10) and thus also the inner room, because the medium achieves lighting by radiation. In addition, the screening by the medium (10), whose color can be changed by an electrolytic effect, is also guaranteed.
  In reference to the manufacture of window assemblies, it is not economicsl to fulfill the function of screening and lighting twice.

- Claim 13: The justification for the amendment of Claim 13 can be obtained from the above explanation of Claim 12.
  In Claim 13, the components of Figure 1, namely the colored lamp 8, and the curved surface element 5, were removed, because Claim 13 no longer refers to one of Claims 1-12.
  In addition, the external window glass surface 2 and the interior window glass surface 3 were included in the Claim 13.

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